Proceedings of the Zoological Institute RAS
Vol. 324, No. 3, 2020, pp. 298–305
10.31610/trudyzin/2020.324.3.298

УДК 595.722

A review of the genus *Chrastoblatta* Saussure et Zehntner, 1895 (Dictyoptera: Ectobiidae: Blattellinae)

L.N. Anisyutkin

Zoological Institute of the Russian Academy of Sciences, Universitetskaya Emb. 1, 199034 Saint Petersburg, Russia; e-mails: Leonid.Anisyutkin@zin.ru, leonid.dictyoptera@gmail.com

ABSTRACT

This paper gives a review of the insufficiently studied genus *Chrastoblatta* Saussure et Zehntner, 1895. The genus *Chrastoblatta* was described from Madagascar (environs of Antananarivo) and includes two species: *Ch. tricolor* Saussure et Zehntner, 1895 and *Ch. dimidiata* (Saussure, 1863). This contribution is based on the study of a series of paralectotypes of *Ch. tricolor* and syntypes of *Ch. dimidiata* from The Muséum d'histoire naturelle in Geneva. Additional specimens of *Ch. tricolor* were found in the collection of the Zoological Institute of the Russian Academy of Sciences in Saint Petersburg. Detailed morphological description of the type species, *Ch. tricolor*, is given. Particular attention is paid to the structure of the male and female genitalia, which are described for the first time. *Chrastoblatta dimidiata* is briefly described due to insufficient and damaged material, but it is probably closely related to the type species. The genus *Chrastoblatta* is characterized by a peculiar structure of the wide and flat head, hind tibiae with concavity at the apex, a distinctly reduced 4th segment of the tarsi, an asymmetrical hypandrium, and robust, curved styli. The presence of not inverted genitalia suggests the placement of *Chrastoblatta* in the subfamily Blattellinae. At the present time, the differential diagnosis of the genus *Chrastoblatta* based on characters of the male and female genitalia cannot be compiled due to insufficient knowledge of other Madagascan ectobiids.

Key words: *Chrastoblatta*, cockroaches, Madagascar, morphology, taxonomy

Обзор рода *Chrastoblatta* Saussure et Zehntner, 1895 (Dictyoptera: Ectobiidae: Blattellinae)

Л.Н. Анисюткин

Зоологический институт Российской академии наук, Университетская наб. 1, 199034 Санкт-Петербург, Россия; e-mails: Leonid.Anisyutkin@zin.ru, leonid.dictyoptera@gmail.com

РЕЗЮМЕ

В этой статье дается обзор недостаточно изученного рода *Chrastoblatta* Saussure et Zehntner, 1895. Род *Chrastoblatta* был описан с острова Мадагаскар, окрестности Антананариву, и включает 2 вида: *Ch. tricolor* Saussure et Zehntner, 1895 и *Ch. dimidiata* (Saussure, 1863). Эта работа основана на изучении серии паралектотипов *Ch. tricolor* и синтипов *Ch. dimidiata* из коллекции Музея Естественной Истории г. Женева. Дополнительные экземпляры *Ch. tricolor* были найдены автором в коллекции Зоологического института РАН в Санкт-Петербурге. В статье дается детальное морфологическое описание *Ch. tricolor*, типового вида рода. Особое внимание было обращено на строение гениталий самцов и самок, которые описаны впервые для этого вида. Вид *Ch. dimidiata* описан только кратко по причине малого числа и плохого состояния доступных экземпляров, но, по-видимому, близко родственен типовому виду. Для рода *Chrastoblatta* характерен набор специфических признаков: широкая и плоская голова, задние голени с выемкой у вершины, отчетливо уменьшенный 4-й членик лапок, асимметричный гипандрий, массивные и изогнутые грифельки. Не инвертированные гениталии самцов свидетельствуют о принадлежности *Chrastoblatta* к подсемейству Blattellinae. Дать в настоящее время дифференциальный диагноз рода на основании признаков строения гениталий самцов и самок невозможно по причине недостаточной изученности остальных мадагаскарских эктобиид.

Ключевые слова: *Chrastoblatta*, тараканы, Мадагаскар, морфология, таксономия

INTRODUCTION

The insufficient knowledge of many taxa is the main obstacle to the construction of classification of the order Dictyoptera. The Madagascan genus *Chrastoblatta* Saussure et Zehntner, 1895 is known only from the original description (Saussure and Zehntner 1895). The structure of the male and female genitalia has not been described until now.

The author had an opportunity to study a series of paralectotypes of *Ch. tricolor* Saussure et Zehntner, 1895 and syntypes of *Ch. dimidiata* (Saussure, 1863) during a visit to The Muséum d'histoire naturelle in Geneva in 2017. Later, three additional specimens of *Ch. tricolor* were found in the collection of the Zoological Institute of the Russian Academy of Sciences (Saint Petersburg).

The aim of this study is to provide morphological descriptions that are detailed enough for further phylogenetic investigations.

MATERIAL AND METHODS

The author generally follows the methods described in Anisyutkin (2012). Rehn's (1951) interpretation of tegmina and wing venation is used with some modifications. Description of armament of anterior margin of fore femur follows Bey-Bienko (1950) and Roth (2003). The terminology of male genital sclerites follows Klass (1997) with some modifications. The terminology used by Grandcolas (1996) for genital structures is given in parentheses. Terminology of female genital structures follows McKittrick (1964) and Klass (1998).

Material studied has been deposited in the Muséum d'histoire naturelle in Geneva (MHNG) and in the Zoological Institute of the Russian Academy of Sciences (ZIN).

Abbreviation used in figures and descriptions

See text for further details.

VII, *VIII*, *IX* – 7th–9th abdominal tergites;
1pl., *2pl.*, *3pl.* – 1st–3rd plical veins of wing;
a.a. – anterior arch of second valvifer of female genitalia;
bsv. – basivalvula of female genitalia;
CuA – area of cubitus anterior vein branches;
CuP – cubitus posterior vein (= plical furrow sensu Rehn 1951);
gg. – gonangulum of female genitalia;
hge. – groove of sclerite L3 in male genitalia (sensu Klass 1997);
intc.s. – intercalary sclerite of female genitalia;
M – area of media vein branches;
M+CuA – area of media and cubitus anterior veins branches;
m.l.vs. – membranous lobes of trident-like subsclerite of vestibular sclerite of female genitalia;
out. – lobe-like outgrowth of sclerite L2D in male genitalia;
par. – paraproct;
pl. – sclerotized lobes of 2nd and 3rd pairs of valves of female genitalia;
R1N, *R2*, *R3* – sclerites in male genitalia;
RA – area of anterior branches of radius;
RS – area of radius sector branches of radius;
Sc – area of subcosta vein branches;
scl. – sclerites located medially to apex of tergal processes IX of female genitalia;
teIX. – tergal process of 9th abdominal tergite;
teVIII? – probable remnant of tergal process of 8th abdominal tergite;
tr.vs. – trident-like subsclerite of vestibular sclerite of female genitalia;
u.vs. – paired upper subsclerites of vestibular sclerite of female genitalia;
v.I., *v.II.* – 1st and 2nd valves of ovipositor;
X – 10th abdominal tergite or anal plate.

SYSTEMATICS

Family Ectobiidae Brunner von Wattenwyl, 1865

Subfamily Blattellinae Karny, 1908

Genus *Chrastoblatta* Saussure et Zehntner, 1895

Type species: *Chrastoblatta tricolor* Saussure et Zehntner, 1895. By subsequent designation (Princis 1951).

Notes. At the present time, the differential diagnosis of the genus *Chrastoblatta* based on characters of the male and female genitalia cannot be compiled due to insufficient knowledge of other Madagascan ectobiids.

Chrastoblatta tricolor, the type species of the genus *Chrastoblatta*, is readily distinguished from other genera of Ectobiidae by the following features: flat

head, presence of concavity at apex of tibia (Fig. 7), small 4th segment of tarsus (Fig. 9), peculiar shape of hypandrium and styli (Figs 15–17). *Chrastoblatta dimidiata* (Saussure, 1863), the second species of the genus *Chrastoblatta*, is described on the basis of insufficient material (see below), but it is probably closely related to the type species.

The presence of concavity at the apex of the tibia and a small 4th segment of the tarsus can be considered as a preliminary diagnosis of the genus *Chrastoblatta*.

The presence of not inverted genitalia suggests the placement of *Chrastoblatta* in the subfamily Blattellinae. The structure of the right phallomere of *Ch. tricolor* is somewhat similar to that of *Blattella* Caudell, 1903, i.e. the cleft formed by sclerites R1N and R2 is directed cranially to the base of sclerite R3 [compare Figs 18, 19 and fig. 2A in Roth (1985)].

Composition. *Ch. tricolor* and *Ch. dimidiata* (Saussure, 1863).

Distribution. Madagascar, environs of Antananarivo (Saussure and Zehntner 1895).

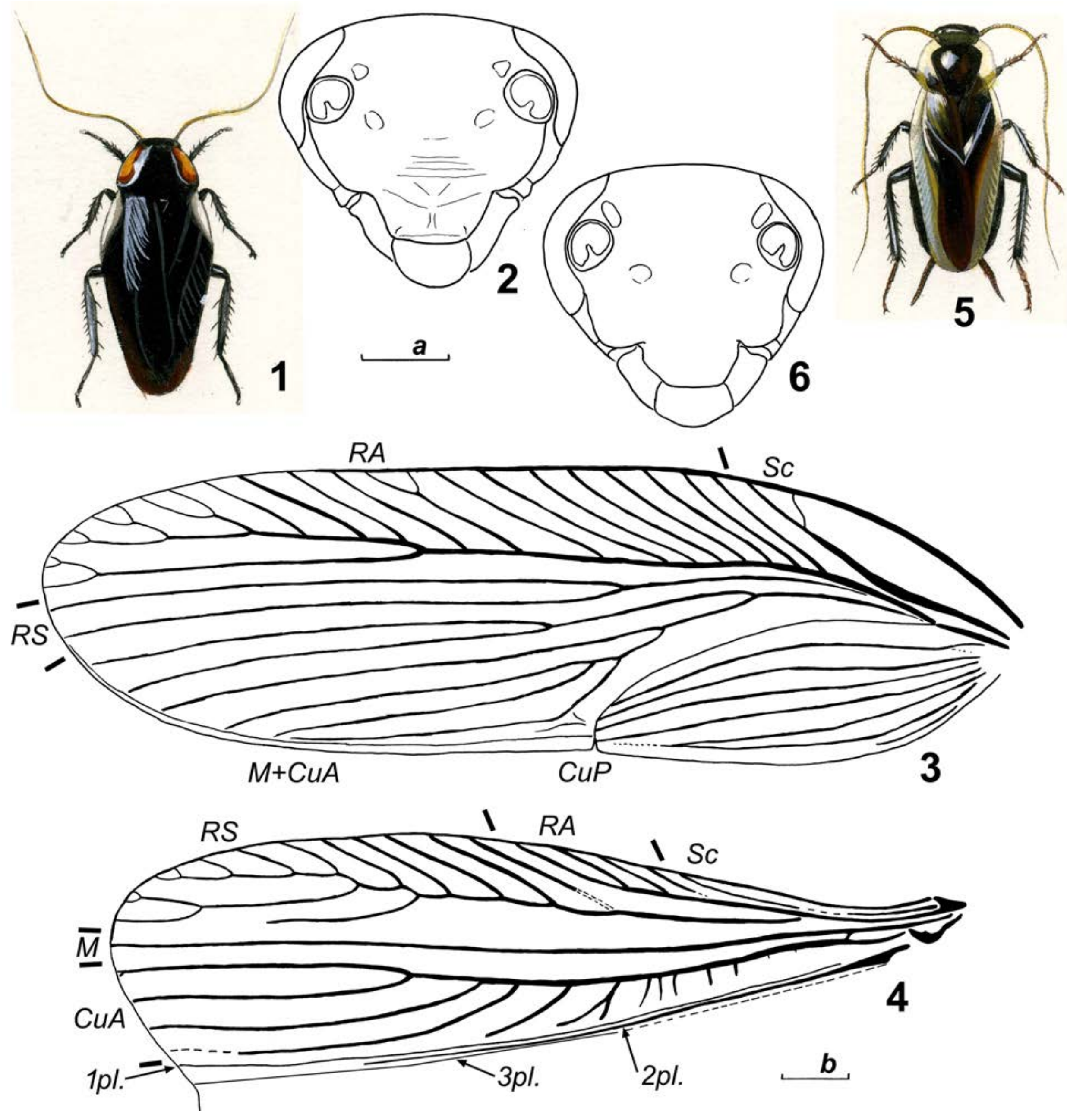
***Chrastoblatta tricolor* Saussure et Zehntner, 1895**
(Figs 1–4, 7, 9, 11–23, 24–28)

Material examined. *Paralectotypes* – MADAGASCAR: “Madagascar m’ H. de Sauss.”, “*Chrastoblatta tricolor* Sss. ♂” – 3 males (MHNG); “Madagascar. (F. Sikora)”, “*Pseudischnopt. tricolor*, Sss. ♀.” – 1 female (MHNG); “Madagascar. (F. Sikora)”, “*Chrastoblatta tricolor* S. & Z. ♀” – 2 females (MHNG); “Madagascar m’ H. de Sauss.”, “*Chrastoblatta tricolor* Sss. ♀” – 2 females (MHNG); “Madagascar m’ H. de Sauss.”, “*Chrastoblatta tricolor*” – 2 females (MHNG); “*Chrastoblatta tricolor* S. & Z. ♀” – 1 female (MHNG).

Other material sudied – “Madagascar”, “*Chrastoblatta tricolor*, Sauss.”, “R. Shelford det.” – 1 male (ZIN); “Madagascar”, *Chrastoblatta tricolor* Sauss. R. Shelford det.”, “167” – 1 female (ZIN); “Madagascar m’ de Sauss”, “*Chrastoblatta tricolor*.”, “Saussure det.”, “No. 131–97.” – 1 female (ZIN).

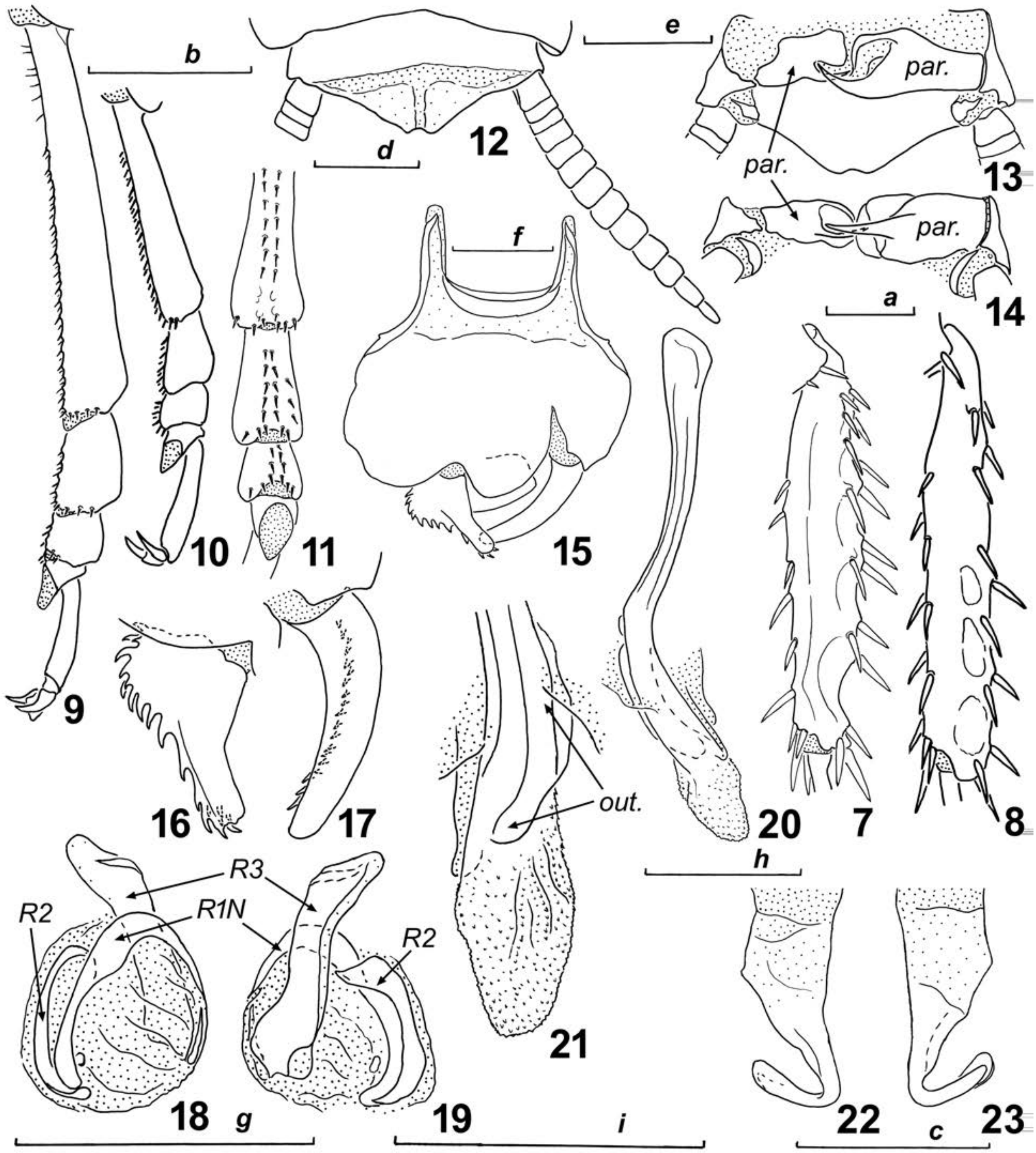
Redescription. The original description (Saussure and Zehntner 1895) can be supplemented with the following details, based on specimens listed above. Measurements are given on the basis of one male from MHNG and specimens from ZIN.

Male (Figs 1–4, 7, 9, 11–23). General colour dark brown, nearly black, with exception of yellowish lateral parts of pronotum, whitish (translucent) costal field in tegmina (Fig. 1) and two whitish parts (~17/24–28/33 and 50/53–56/60 segments) in antennae. Surfaces smooth and lustrous. Head wide and flat (Fig. 2); distance between eyes 1.3–1.4 times eye length; distance between antennal sockets about 2.1–2.2 times scape length (~0.7–0.8 mm); approximate length ratio of 3rd–5th segments of maxillary palps 1.3 : 1.0 : 1.3–1.5. Pronotum as in Fig. 1. Tegmina and wings completely developed (Figs 1, 3, 4), surpassing abdominal apex. Tegmina weakly sclerotized, with distinct venation (Fig. 3); *Sc* short, moderately thickened (distinctly visible on ventral side of tegmen) and forked apically; *R* divided into *RA* and *RS*, *RA* with numerous (~10–12) anterior rami; *RS* forked; *M* and *CuA* fused, with about 5–6 veins; *CuP* distinct; anal veins about 6–7 veins. Wings weakly sclerotized (Fig. 4); *Sc* weak and short, partly interrupted; *RA* short, with 4–5 anterior rami; *RS* well developed, with 8–9 anterior and 1–2 posterior rami; *M* simple; *CuA* pectinate, with 3 complete (reaching to wing margin) veins; long and simple vein located posterior to *CuA* (Fig. 4, *1pl.*), probably corresponding to 1st plical vein sensu Rehn (1951) or *CuP* [probably *CuP* + *A1* sensu Bey-Bienko (1950)]; next vein incrassated and incomplete (Fig. 4, *2pl.*) (not reaching to wing margin), probably corresponding to 2nd plical vein sensu Rehn (1951) [probably *A2* sensu Bey-Bienko (1950)]; third vein (Fig. 4, *3pl.*) weak and simple, basally interrupted, probably corresponding to 3rd plical vein sensu Rehn (1951); anal fan consisting of 13–14 veins reaching margin of wing. Fore tibiae not thickened distally. Anterior margin of fore femora of armed type A, with 11–13 spines, including 2–3 apical ones; row of spines displaced distally to apical spines. Hind tibiae with concavity at apex (Fig. 7). Structure of hind tarsus (Figs 9, 11): metatarsus longer than other tarsal segments combined (Fig. 9); euplantulae of metatarsus, 2nd and 3rd segments very small and apical, these segments with 2 more or less equal rows of spines along lower margin, euplantulae and distal margin of segments bordered with short rows of spines (Fig. 11); 4th segment distinctly reduced in size, with large euplantula and without spines; claws symmetrical and simple; arolium about half as long as claw. Abdomen without visible glandular specializations. Anal plate (tergite X) transverse (Fig. 12), with distal part weakly sclerotized and median incision on hind margin. Cerci long, with distinct segments (Fig. 12). Paraprocts asymmetrical (Figs 13, 14, *par.*),

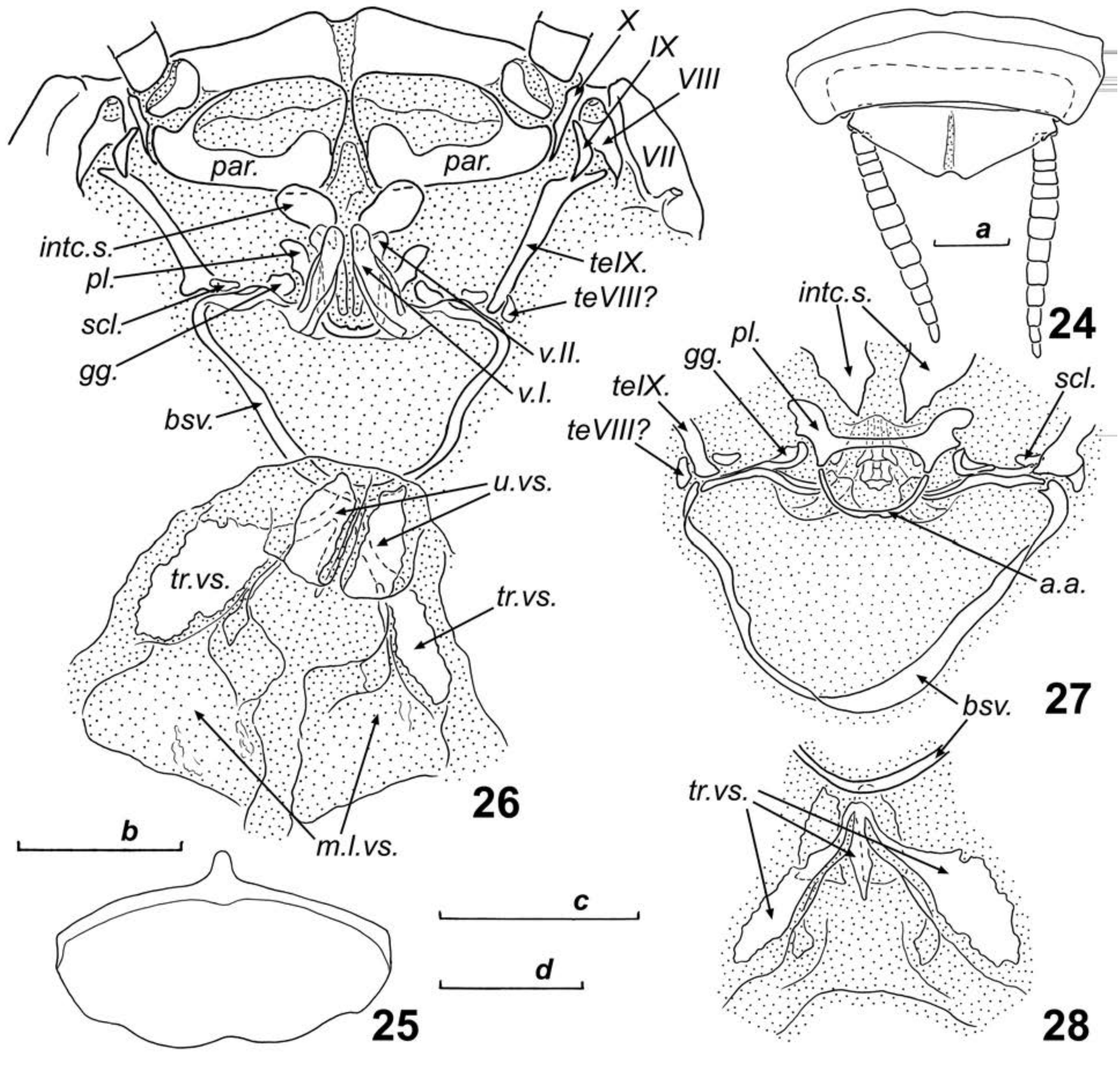


Figs 1–6. *Chrastoblatta* spp., specimens from MHNG: *Ch. tricolor*, male, paralectotype (1–4) and *Ch. dimidiata*, female, syntype (5, 6). 1, 5 – General view from above (after Saussure and Zehntner 1895); 2, 6 – Facial part of head; 3 – Right tegmen from above; 4 – Anterior part of right wing from above. In tegmen and wing only main veins are shown, membrane reticulation is omitted. Abbreviations: *1pl.*, *2pl.*, *3pl.*, *CuA*, *CuP*, *M*, *M+CuA*, *RA*, *RS*, *Sc* – see text. Scale bar 1 mm: a = 2, 6; b = 3, 4. Figs 1, 5 out of scale.

with sharp and curved spines at mediocaudal angles. Hypandrium asymmetrical (Fig. 15), with caudal margin (between styli) roundly protruded caudally. Styli strongly asymmetrical (Figs 15–17), robust and curved; right stylus (Figs 15, 16) enlarged at base, with teeth on outer margin and apex; left stylus cylindrical and curved, with row of teeth along upper margin (Figs 15, 17).



Figs 7–23. *Chrastoblatta* spp., specimen from MHNG: *Ch. tricolor*, male, paralectotype (7, 9, 11–23) and *Ch. dimidiata*, female, syntype (8, 10). 7, 8 – Left hind tibiae from below; 9, 10 – Left hind tarsi from below (anterior); 11 – 1st (partly) – 4th segments of left hind tarsus from below; 12 – Abdominal apex from above, only right cercus is shown; 13, 14 – Paraprocts from below (13) and caudal (14); 15 – Hypandrium from below; 16, 17 – Right (16) and left (17) styli from below; 18, 19 – Right phallomere from above (18) and below (19); 20 – Sclerite L2D from above; 21 – Apical part of sclerite L2D from below; 22, 23 – Sclerite R3. Dotted areas show membranous parts. Abbreviations: *out.*, *par.*, *R1N*, *R2*, *R3* – see text. Scale bar 1 mm: a = 7, 8; b = 9, 10; c = 11, 16, 17, 22, 23; d = 12; e = 13, 14; f = 15; g = 18, 19; h = 20; i = 21.



Figs. 24–28. *Chrastoblatta tricolor*, female, specimen from ZIN. 24 – Abdominal apex from above; 25 – Genital plate from below; 26 – Abdominal apex, ovipositor and adjacent structures from below, genital plate removed; 27 – Basal part of ovipositor from above; 28 – Vestibular sclerite from above. Dotted areas show membranous parts, except for valves of ovipositor. Abbreviations: *VII*, *VIII*, *IX*, *X*, *aa.*, *bsv.*, *gg.*, *intc.s.*, *m.l.vs.*, *par.*, *pl.*, *scl.*, *teIX.*, *teVIII?*, *tr.vs.*, *u.vs.*, *v.I.*, *v.II.* – see text. Scale bar 1 mm: a = 24, 25; b = 26; c = 27; d = 28.

Male genitalia (Figs 18–23) not inverted. Right phallomere (*R*+*N*) (Figs 18, 19): sclerite *R1N* long, narrow and sickle-curved, *R2* of similar shape, but shorter; *R3* elongated. Sclerite *L2D* (*L1*) not divided into apical and basal parts (Fig. 20), rod-like, elongated and curved, weakly widened cranially; apical part widened and densely covered with small teeth, with lobe-like outgrowth caudally (Fig. 21, *out*.). Sclerite *L3* (*L2d*) short and wide (Figs 22, 23), with groove *hge*; basal subsclerite and “folded structure” absent. Sclerite *L4U* (*L3d*) absent.

Female (Figs 24–28). Generally similar to male. Anal plate (Fig. 24) similar to that of male, but more sclerotized. Paraprocts symmetrical, with large membranous area at caudo-medial angles (Fig. 26, *par.*). Genital plate transverse, caudally sinuate (Fig. 25).

Ovipositor and adjacent structures (Figs 26–28). Intercalary sclerite divided into two parts (Figs 26, 27, *intc.s.*). Tergal processes of abdominal segment VIII reduced, probably present as small sclerite at apex of tergal processes of abdominal tergite IX (Figs 26, 27, *teVIII?*); those of abdominal segment IX fully developed and heavily sclerotized (Figs 26, 27, *teIX.*). Gonangulum small, well sclerotized (Figs 26, 27, *gg.*). Pair of small separated sclerites located medially to apex of tergal processes IX (Figs 26, 27, *scl.*). All valves of ovipositor well developed (Fig. 26), sclerotized, but with membranous parts; 1st valves large, without distinct rows of setae along inner side (Fig. 26, *v.I.*); 2nd valves fused at base (Fig, 26, *v.II.*); 3rd valves smaller, as compared with 1st and 2nd ones, located between 2nd ones. Base of 2nd and 3rd pairs of valves as in Fig. 27, sclerotized lobes large and fused (Figs 26, 27, *pl.*). Anterior arch of second valvifer as in Fig. 27, *a.a.* Basivalvula developed as asymmetrical and thin horseshoe-shaped sclerite (Figs 26, 27, *bsv.*). Vestibular sclerite complicated (Figs 26, 28), with deeply separated paired upper subsclerites (Fig. 26, *u.vs.*) and lower trident-like subsclerite (Figs 26, 28, *tr.vs.*); lateral processes of trident-like subsclerite continue into membranous lobes (Fig. 26, *m.l.vs.*).

Measurements. Head length: male 2.9–3.1, female 2.4–2.6; head width: male 3.0–3.2, female 3.0; pronotum length: male 3.5–3.7, female 3.5–3.4; pronotum width: male 5.2–5.8, female 5.2–5.4; tegmen length: male 14.0–14.9, female 12.5–12.8; tegmen width: male 3.8–4.0, female 3.8.

Note. The series of syntypes was divided between The Muséum d'histoire naturelle in Geneva and Muséum national d'Histoire naturelle in Paris (Saussure and Zehntner 1895). Later, the male from collection of The Muséum national d'Histoire naturelle was designated as a lectotype by K. Princis: "... ich wähle hiermit dieses Männchen als Typenexemplar für *C. tricolor.*" – Princis 1951, p. 92).

Chrastoblatta dimidiata **(Saussure, 1863)**
(Figs 5, 6, 8, 10)

= *Chrastoblatta marginata* (Brunner von Wattenwyl, 1865)

Material examined. *Syntypes* – MADAGASCAR: "Madagascar. Sikora.", "No 32", "*Chrastoblatta dimidiata* ♀ Sauss." – 1 female (MHNG); "*Chrastoblatta dimidiata* ♀ Sauss.", label with handwritten illegible text – 1 female (MHNG).

Notes. This species was described in the genus *Proscratea* Burmeister, 1838 in a paper based on the material from The Muséum d'histoire naturelle in Geneva and Museum in Neuchatel (Saussure 1863). No data about the number and sex of specimens were given, the geographical location was given as "Madagascar" (Saussure 1863). It was transferred to the genus *Chrastoblatta* by Saussure and Zehntner (1895). In the latter publication the geographical location was given as environs of Antananarivo (Saussure and Zehntner 1895).

There are 2 specimens of *Ch. dimidiata* in the collection of The Muséum d'histoire naturelle in Geneva (see "Material examined"). The Figs 6, 8 and 10 are drawn from the first specimen. The second specimen (with a handwritten illegible label) is strongly damaged: only part of the thorax, the abdomen without an apex, coxa, femur and, partly tegmen and wing are present.

This species is habitually similar and most likely is closely related to *Ch. tricolor.* Nevertheless, some diagnostic features are less developed in *Ch. dimidiata*, as compared with *Ch. tricolor.* There are less developed concavity at the apex of the tibia (Fig. 8) and a comparatively larger 4th segment of the tarsus (Fig. 10). It is impossible to clarify the taxonomic position of this species without studying additional material.

Chrastoblatta marginata was described on the basis of a female from Madagascar (without an exact location) and placed in the genus *Proscratea* by Brunner von Wattenwyl (1865). Later, this species was synonymized with *Ch. dimidiata* by Walker (1869).

ACKNOWLEDGEMENTS

I am greatly indebted to Dr. Peter Schwendinger (MHNG) for the opportunity to study the Dictyoptera collections of the Muséum d'histoire naturelle de Genève and for his hospitality during my visits to Genève and wish to express my sincere thanks to S. Lukyantsev and E. Shcherbakov for their valuable comments on the manuscript. The study was performed as part of the state research project AAAA-A17-117030310205-9.

REFERENCES

Anisyutkin L.N. 2012. A description of a new species of the cockroach genus *Prosoplecta* Saussure, 1864 (Dictyoptera, Ectobiidae) from South Vietnam. *Entomologicheskoe Obozrenie*, **91**(4): 742–756. (English translation published in *Entomological Review*,

2013, **93**(2): 182–193). https://doi.org/10.1134/S0013873813020061
Bey-Bienko G.Ya. 1950. Cockroach insects. Fauna USSR, New Ser., 40. Moscow–Leningrad, 343 p. [In Russian].
Brunner von Wattenwyl C. 1865. Nouveau système des Blattaires. Carl Ueberreuter, Wien, 426 p. https://doi.org/10.5962/bhl.title.5652
Grandcolas P. 1996. The phylogeny of cockroach families: a cladistic appraisal of morpho-anatomical data. *Canadian Journal of Zoology*, **74**(3): 508–527. https://doi.org/10.1139/z96-059
Klass K.-D. 1997. The external male genitalia and the phylogeny of Blattaria and Mantodea. Bonner *Zoologische Monographien*, **42**: 1–341.
Klass K.-D. 1998. The ovipositor of Dictyoptera (Insecta): homology and ground-plan of the main elements. *Zoologischer Anzeiger*, 236: 69–101.
McKittrick F.A. 1964. Evolutionary studies of cockroaches. *Cornell University Agricultural Experiments Station Memoir*, **389**: 1–197.
Princis K. 1951. Kleine Beiträge zur Kenntnis der Blattarien und ihrer Verbreitung. IV. *Opuscula entomologica*, **16**: 89–93.
Rehn J.W.H. 1951. Classification of the Blattaria as indicated by their wings (Orthoptera). *Memoirs of the American Entomological Society*, **14**: 1–134.
Roth L.M. 1985. A taxonomic revision of the genus *Blattella* Caudell (Dictyoptera, Blattaria: Blattellidae). *Entomologica scandinavica, Supplement*, **22**: 1–221.
Roth L.M. 2003. Systematics and Phylogeny of Cockroaches (Dictyoptera: Blattaria). *Oriental Insects*, **37**: 1–186. https://doi.org/10.1080/00305316.2003.10417344
Saussure H. de. 1863. Mélanges Orthoptérologiques. Blattides. *Mémoires de la Société de Physique et d'Histoire Naturelle de Geneve*, **17**: 129–171.
Saussure H. de and Zehnther L. 1895. Histoire naturelle des Blattides et Mantides. In: A. Grandidier (Ed.). Histoire physique, naturelle et politique de Madagascar. V. 23. Histoire naturelle des Orthoptères. L'imprimerie nationale, Paris: 2–244.
Walker F. 1869. Catalogue of the specimens of Dermaptera Saltatoria and supplement to the Blattariae in the collection of the British Museum. British Museum, London, 224 p. https://doi.org/10.5962/bhl.title.28190

Submitted 26 May 2020; accepted 13 July 2020.